

the masses rich in alkalies and the biotite-peridotites. Mr. Kynaston (p. 102) regards this rock, with the granites and diorites of the north-west area, as contemporaneous with the Ben Cruachan granite, that is, as later than the Lower Old Red Sandstone lavas. The regional metamorphism of the older rocks of mid-Argyll is not due to these numerous intrusive masses, nor to any concealed dome of granite. It increases in intensity from north-west to south-east, and also along the strike of the ancient sedimentary series in a north-easterly direction, so that comparatively unaltered rocks of the "Loch Awe group" (p. 76) pass, outside the limits of Sheet 37, into schists of a very pronounced degree of crystallisation. Local thermal alteration tends to mask both the original clastic structures and the subsequent foliation (p. 39).

The form of the lake-floors in connection with the passage of ice across them is interestingly discussed in chapter xiii. At the time of maximum glaciation, the upper portion of the Loch Fyne ice moved out westward towards the Sound of Jura, the general south-westerly course being resumed as the ice thinned down again and became guided by the topographic features. It is held that Loch Awe at one time drained southward, when the level of its waters was nearly 200 feet higher than at present.

The economic resources of the district, which are neither conspicuous nor generally accessible, are referred to at the close of the memoir. If petrographic details naturally predominate in such a work, they only testify to the scientific thoroughness with which the Geological Survey is encouraged to explore the Scottish highlands.

THE EGYPTIAN HEAVEN AND HELL.¹

IN his "Egyptian Heaven and Hell" Dr. Wallis Budge has contributed another work to his already long list of books dealing with the subject of ancient Egyptian religions. It appears in three-volume form in the useful little series of "Books on Egypt and Chaldaea," written by Dr. Budge and Mr. L. W. King, and published by Messrs. Kegan Paul. Those who are interested in the subject are familiar with Dr. Budge's edition of the "Book of the Dead" in the same series. These volumes form a companion work, being an edition of the two subsidiary collections of funerary texts, "The Book of the Am-Tuat (that which is in Hades)" and "The Book of the Gates," which accompanied the great "Chapters of Coming Forth into the Day," the "Book of the Dead" proper. As in the former work, Dr. Budge gives the text, translation, and illustrations from the original papyri.

The two subsidiary books differ somewhat in purpose and scope from the "Book of the Dead" itself. The latter is a collection of spells and "words of magic power" to be learnt by the dead in order to win their way past the dangers of the unseen world into the presence of Osiris. The individual dead man, identified with Osiris, "the Osiris N," is the central figure of every chapter of the "Book of the Dead." "Chapter so-and-so. I, the Osiris so-and-so, say," and so on. But in the Book of That

¹ "The Egyptian Heaven and Hell." By E. A. Wallis Budge, Litt.D. Vol. i., The Book Am-Tuat, pp. viii+278; vol. ii., The Book of Gates, pp. viii+306; vol. iii., The Contents of the Books of the Other World described and compared, pp. xviii+232. (London: Kegan Paul and Co., Ltd., 1906.) Price 6s. net each volume.

which is in Hades, and in the Book of the Gates, the dead man is not the principal figure. In fact, in the first-named (hereinafter called "The Book of the Tuat") he hardly appears at all; the book is merely a description of the other world as it appears to the beatified spirits who follow the bark of the sun-god in its passage through Hades (the Tuat) from west to east, from his setting to his rising. During the night the dead sun-god, known as Auf ("his limbs," i.e. the carcass of the sun), sails through the regions of the underworld to give light to the dwellers therein, and during his voyage the souls of the blessed rise up and join themselves to his boat. It is a weird conception, and the description of these regions of the dark beyond, as given in Dr. Budge's book, is still more weird. The Tuat is divided into several distinct Tuats, each corresponding to one of the great Egyptian necropolises, Abydos, Thebes, Sakkara, and Heliopolis. Each has its peculiar features, and appears to be tenanted by demons and spirits with unpronounceable names and of strange appearance, some of whom are good and help the bark of the god on its way, while others are bad and seek by every means in their power to oppose its progress. These are vanquished in succession as the sun passes their territories. The "Book of the Gates" is so called on account of its chief feature being the successive mention of the gates of the Tuats, each of which has its demon-guardian, who is passed by means of the appropriate spell. In it the

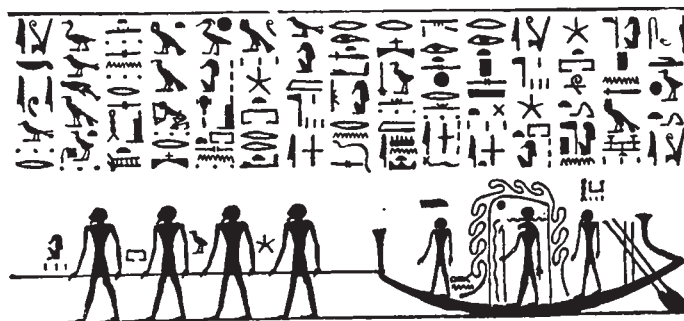


FIG. 1.—The Boat of the Sun towed by Gods of the Tuat. From "The Egyptian Heaven and Hell," vol. ii., The Book of Gates.

god Osiris appears, but not to the extent to which he appears in the "Book of the Dead," the chapters of which seem to have originally emanated from the original seat of his worship at Busiris in the Delta. Indeed, the "Book of the Tuat" may be a much later invention of the Theban priests, designed to divert the attention of the faithful from the northern Osiris to the sun-god of Thebes. It is homogeneous in plan, which the "Book of the Dead" is not. Dr. Budge gives a parallel version of both subsidiary books in his third volume, so that they can conveniently be compared. In the same volume are to be found his introduction and a most compendious index.

The pictures of these two books are extremely remarkable. Their general appearance will be well known to those who have visited the tombs of the kings at Thebes, or have seen the wonderful alabaster sarcophagus of King Seti I. in Sir John Soane's museum in Lincoln's Inn Fields. Under the eighteenth and nineteenth dynasties the walls of the royal tombs were decorated with scenes from the "Book of the Tuat" and "Book of the Gates," so that the dead monarchs could see in pictures at least the weird forms which the imagination of the

Egyptians conceived as inhabiting the tomb-world; and occasionally sarcophagi were ornamented in the same manner. Some of the best illustrations in Dr. Budge's book are taken from the sculptures of Seti's sarcophagus.

The conceptions of the rewards and punishments

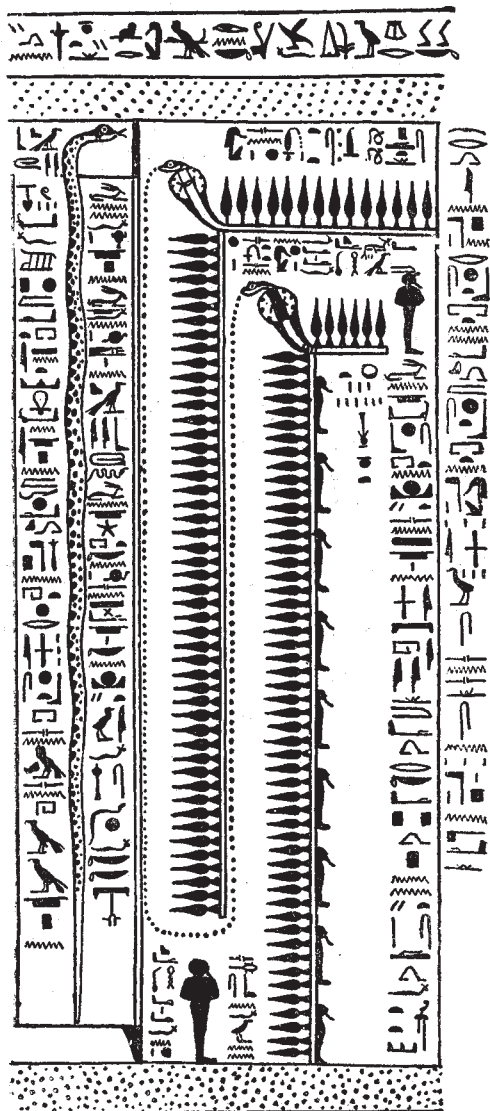


FIG. 2.—The Gate of the Serpent Agebi. From "The Egyptian Heaven and Hell," vol. ii., The Book of Gates.

of the dead in the next world as given in these two books are also well worth the attention of the anthropologist.

ANCIENT ECLIPSES.

THE results of recent discussion of ancient eclipses may for convenience be divided into three sections. The conclusion of each section depends upon the truth of the conclusions of the preceding sections, but not vice versa, that is to say, the results of the last section may be rejected without in the least impairing the validity of the earlier conclusions. The results are as follows:—

(1) If an astronomer had been asked a year ago by

a historian or a chronologist whether the tables of the sun and moon accurately accounted for the recorded phenomena of ancient eclipses, he could only have replied that the tables failed altogether to account for the solar eclipses; that they had been empirically altered so as to account for the observed times of certain lunar eclipses; and that the question whether the tables so altered accounted for the *magnitudes* of the same lunar eclipses had not even been examined. There seemed to be no possible modification of the tables that would bring them into harmony with the recorded solar eclipses, and it was therefore the received opinion that the historical accounts of these were untrustworthy. The first result is that two slight modifications of the existing tables will cause them to satisfy the records.

The modifications in question may be stated as follows:—Define the nodical month as the mean period between one passage of the moon from south to north of the ecliptic and the next passage, and define the nodical year as the mean period between one passage of the sun from south to north of the plane of the moon's orbit and the next passage, purely periodic variations being left out of account. Then the eclipses show that the rate of change of length of both the nodical month and nodical year as given in the tables must be altered.

(2) The second section of the results is concerned with the question, "In order to alter the rate of variation of the nodical year, are we to alter the acceleration of the node or of the sun?" Now the motion of the node depends upon theory, and the same theory which accounts for its motion at the present time will suffice to calculate its motion at any time during the last few centuries. The motion of the sun, however, is purely a question of observation. Unknown causes may easily be conceived as altering its motion. The second result is therefore to ascribe an acceleration to the sun's motion to account for the variation in the nodical year inferred from ancient eclipses, or in other words, we may leave out the word "nodical" in our statement and say, "The ancient eclipses indicate certain definite rates of change in the lengths of the month and year."

(3) We lastly require some physical explanation of the sun's acceleration. Here there are many possibilities. The æther may offer a sensible resistance to the passage of the earth; or an electro-magnetic theory of gravitation may compel us to take account of the small, but not infinitesimal, ratio between the velocity of a planet in its orbit and the velocity of light; or again, electrical theories of matter somewhat modify the old conception of mass, and with it the fundamental equations of motion on which planetary theory rests. But the explanation tentatively put forward at the April meeting of the Royal Astronomical Society is as follows:—Let us suppose the acceleration of the sun to be due to a change in the length of the day caused by tidal friction. The tides check the rotation of the earth, lengthen the day, and therefore apparently increase all diurnal movements by the same fraction of their whole amounts. Introducing numbers for greater definiteness, let us suppose that in a century the day increases in length by a two-hundredth part of a second of time. Then in a century the sun's apparent rate of motion will increase by one part in seventeen million, which is exactly the change indicated by the eclipses. If, however, the moon's apparent rate of motion also increased by one part in seventeen million the acceleration would be ten times larger than that indicated by the eclipses.

But if the tides are checking the diurnal rotation of the earth, it follows from the principle of conserva-